REVIEW OF RED SNAPPER (*LUTJANUS CAMPECHANUS*) DATA IN TEXAS

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I. INTRODUCTION

The purpose of this report is to identify and review currently available Texas data on red snapper (*Lutjanus campechanus*) from federal, state, and other sources. These data are compared to information necessary for stock assessment according to NMFS methodology, and indicate that some of the necessary data are at this time unavailable for Texas. It is hoped that this information will be used to develop scientific research in support of the Texas red snapper stock assessment, working towards the goal of more effective and fair management of the red snapper fishery in Texas waters.

What is stock assessment?

Fishery management is based on imperfect estimates of the numbers, weight, productivity, and age structure of fish populations and incomplete knowledge of how these populations change over time. These estimates are imperfect, in part, because the ocean is not transparent and acoustic techniques of remote sensing are not sufficiently developed to accurately census fish populations. Standardized techniques have been developed which sample a relatively small proportion of fish from a population and then combine these data with commercial and recreational catch information to estimate population characteristics. These techniques result in stock assessments used by managers at state, regional, national, and international levels.

What do stock assessment models do?

Assessment models predict rates of change in weight and productivity. These predictions are based on information about the rates at which fish enter the harvestable population (*recruitment*), grow in size, and exit the population (*natural* and *fishing mortality*). In addition to monitoring the abundance and productivity of exploited fish populations, stock assessments are used to provide quantitative predictions of the consequences of possible alternative management strategies (**National Research Council.** 1998. Improving Fish Stock Assessments. National Academy Press, Washington, D.C.)

II. WHAT TYPES OF DATA ARE REQUIRED FOR STOCK ASSESSMENT?

A. BIOLOGICAL CHARACTERISTICS

- MORPHOMETRICS (Physical features of a fish)
  Stock assessment requires information on *numbers of fish* caught to examine population sizes and exploitation levels. Commercial catches are often recorded in pounds, while recreational catches are noted as number of fish caught. Lengths are often recorded in different units as well as different measures of length (Total Length vs. Fork Length). Numbers caught can be estimated if the appropriate weight-length relationships are defined. Length measurements using different units and measures can be converted if the appropriate length-length conversions are developed.

- AGE AND GROWTH
  Evaluated from studies which assign ages from examination of scales, otoliths (ear bones which can be analyzed to estimate age of individual fish) and length-frequencies for the youngest fish.

- MORTALITY
  a. *Natural mortality* – The level of natural mortality (rate of removal of fish from a population due to natural causes) is an important variable for the assessment of stock status and its management. Level of natural mortality determines the unfished lifespan, which is used to set the allowable duration of the recovery period for the stock (for red snapper, currently 1.5 x the unfished generation time). So, the natural mortality has a direct influence on the timing and severity of conservation measures to rebuild the stock, as well as the estimation of its current status.
  b. *Release mortality* - Mortality of released fish is an important consideration in evaluating the conservation effects of regulations that set minimum sizes and total allowable catch (TAC). Sources of release mortality include hooking and handling, in addition to predation of released fish in areas with concentrations of large predators. Mortality of fish released because of size and bag limits is to be expected and the mortality rate may increase with depth of capture, although the precise nature and extent of this mortality is not clearly defined.

- REPRODUCTION

Fecundity (a measurement of the egg-producing ability of a fish which usually changes with age and size) is evaluated as a function of length from data on spawning frequency and numbers of eggs per spawn.

- GENERATION TIME
  Generation time is estimated using estimates of growth, fecundity, and natural mortality of females at different ages.

- RECRUITMENT PATTERNS
  Recruitment estimates evaluate the rates at which fish enter the harvestable population. Data are obtained from a variety of fishery independent surveys.

B. CATCH TRENDS (total fish captured; includes discards & releases)
- COMMERCIAL CATCH
- RECREATIONAL CATCH
- SHRIMP TRAWL DISCARDS

III. WHAT ARE THE TEXAS DATA SOURCES IN USE FOR STOCK ASSESSMENT?

A. BIOLOGICAL CHARACTERISTICS

1. MORPHOMETRICS

a. **Parrack, N. C.** 1986b. Review and update of Gulf of Mexico red snapper biometrics: 1. length-weight relations, 2. length-length conversions. Unpublished report CRD-86/87-3. NMFS, SEFC, Miami Laboratory, Miami, FL.

Commercial catches are often recorded in pounds, while recreational catches are noted as number of fish caught. Lengths are often recorded in different units as well as different measures of length (Total Length vs. Fork Length). Stock assessment requires information on *numbers* of fish caught to examine population sizes and exploitation levels. Numbers caught can be estimated if the appropriate weight-length relationships are defined. Length measurements using different units and measures can be converted if the appropriate length-length conversions are developed. This paper uses observations from five areas of the Gulf of Mexico (including Port Aransas) to update these biometric conversions.

2. AGE AND GROWTH

a. **Parrack, N. C.** 1986a. A review of Gulf of Mexico red snapper age and growth. Unpublished report CRD-86/87-2. NMFS/SEFC, Miami Laboratory, Miami FL. (DO NOT HAVE)

A description of data sources prior to 1986.

b. **Fitzhugh, G. R., L. A. Collins, L. A. Lombardi, M. R. Burnett, W. A. Fable, and W. T. Walling.** 1999. Report of red snapper otolith aging and

spawning/fecundity research. Unpublished report, Red Snapper/Shrimp Research Program, Summer 1998 Project, Final Report, SEFSC, April 1999. NMFS, SEFSC, 3500 Delwood Beach Road, Panama City, Florida 32408.

Examined 18,000 otoliths from 1000 sampling trips by 40 port agents between June-October 1998. Samples were collected from Texas (19% of samples) through west Florida. Most otoliths were collected from charter & headboats (64%). Age frequency and size-at-age were examined by fishing mode. Gonad samples focussed on females > 19". Gonads were collected from St. Petersburg, FL to Port Aransas, TX with sampling continued in 1999.

3. MORTALITY

a. Natural Mortality

Level of natural mortality in the Gulf of Mexico red snapper stock is not well defined, even though it is an important variable for the assessment of the status of the stock and its management. Most analyses in past red snapper stock assessments have assumed a natural mortality rate of 0.20 based on estimates in the literature, although observations indicate that the true level of natural mortality is probably less than 0.2. A number of modeling methods to estimate natural mortality are described in the current stock assessment, but these estimates are imprecise & of questionable statistical validity because of their derivation from fished stocks with variable recruitment. The result is that *there is little evidence for the actual level of natural mortality for Gulf of Mexico red snapper.*

b. Release Mortality

Sources of release mortality include hooking and handling, in addition to predation of released fish in areas with concentrations of large predators. Mortality of fish released because of size and bag limits is to be expected and the mortality rate may increase with depth of capture, although the precise nature and extent of this mortality is not clearly defined.

1. **Gitschlag, G. R., and M. L. Renaud.** 1994. Field experiments on survival rates of caged and released red snapper. North American Journal of Fisheries Management. **14**(1):131-136.

Measured the 10-15 day survival of snapper caught at 25 fm on hook and line and either released into cages and lowered to depth or released at the surface. 64% of the caged snapper survived when lowered to 18 fm. There was no difference in survival based on fish size or if the stomach protruded from the mouth when the fish was captured. Survival rate varied with depth of capture, ranging from 99% survival at 11-12 fm to 56% survival at 19-20 fm. This study was conducted on a gas production platform approximately 230 mi SE of Galveston, TX.

2. **Render, J. H., and C. A. Wilson.** 1994. Hook-and-line mortality of caught and released red snapper around oil and gas platform structural habitat. Bulletin of Marine Science **55**(2-3):1106-1111.

   Measured the 24 – 48 hour survival of snapper caught at 10 fm on hook and line and released into a 5 fm deep vertical holding net. Mortality at 5 fm was 20%. There was no difference in survival if the gas bladder was deflated prior to release into the net. Mortality was higher in the fall than in the summer. This study was conducted on a gas production platform approximately 150 mi S of Cameron, LA.

4. REPRODUCTION

The locations of red snapper spawning grounds in Texas are unknown. Recent Texas reproductive biology, age, and growth data by Bumbgardner et al (1996) are not included in the most recent stock assessment. How eggs and larvae are distributed throughout the Gulf of Mexico by water movements is also unknown at this time. Fecundity-at-age appears to be poorly understood for Texas waters.

a. **Bradley, E., and C. E. Bryan.** 1975. Life history and fishery of the red snapper (*Lutjanus campechanus*) in the northwestern Gulf of Mexico: 1970-74. Proceedings of the Gulf and Caribbean Fisheries Institute. **27**:77-106.

   Red snapper were collected from 3 regions along the Texas coast (Galveston-Freeport, Port Aransas, and Port Isabel-Port Mansfield) using hook and line (reefs, 7.5 - 80 fm; primarily along the 40 fm depth contour) and bottom trawls (3 – 95 fm). Maturing fish were found from May through January, but the major period of spawning was June and July, with another peak in November and December. Feeding is probably reduced during the spawning season. Spawning probably occurs off of reef structures on level bottom.

b. **Fitzhugh, G. R., L. A. Collins, L. A. Lombardi, M. R. Burnett, W. A. Fable, and W. T. Walling.** 1999. Report of red snapper otolith aging and spawning/fecundity research. Unpublished report, Red Snapper/Shrimp Research Program, Summer 1998 Project, Final Report, SEFSC, April 1999. NMFS, SEFSC, 3500 Delwood Beach Road, Panama City, Florida 32408.

   Examined 18,000 otoliths from 1000 sampling trips by 40 port agents between June-October 1998. Samples were collected from Texas (19%) through west Florida. Most otoliths were collected from charter & headboats (64%). Age frequency and size-at-age were examined by fishing mode. Gonad samples focussed on females > 19". Gonads were

collected from St. Petersburg, FL to Port Aransas, TX with sampling continued in 1999.

5. GENERATION TIME
Important because the management plan for red snapper specifies that the recovery schedule is to be no greater than 1.5 times the unfished generation time. Generation time is estimated using, among other variables, estimates of fecundity at age and natural mortality of females at different ages. Both of these variables are either uncertain or lack available Texas data.

6. RECRUITMENT PATTERNS
a. Fall Groundfish Survey

The NMFS laboratory in Pascagoula, MS has conducted a fall bottom trawl survey since 1972 using 40-foot bottom trawls during October and November. The early years of the survey included primarily the north central Gulf, but since 1985, the survey has been included in the Southeast Area Monitoring and Assessment Program (SEAMAP) as the Fall Shrimp/Groundfish Survey. The SEAMAP survey includes areas from the eastern Gulf to the Texas/Mexico border. Many vessels are involved, including 2 NOAA ships (40-ft trawls; sample area includes Texas offshore waters), vessels from Alabama (40-ft trawls), Louisiana (40-ft trawls), and five Texas vessels which sample Texas state waters and offshore waters with 20-ft trawls (http://www.gsmfc.org/gsmfc_ov.html). Fish, shrimp and other invertebrates are counted and weighed.

In the past, real-time data has been produced for shrimp catches during the Summer Shrimp/Groundfish Survey. The SEAMAP subcommittee felt it was important that a new program be developed that showed the distribution of juvenile red snapper after the Fall Shrimp/Groundfish Survey.

The squares on the charts are 10-minute grids and contain an average catch or count from one or more sampling stations within a particular grid. The sampling stations were located randomly by depth zone.

The 1999 Survey took place from October 16 to December 3, 1999. Survey areas and station locations are depicted in Figure 1. Mean catch rates by 10 minute blocks of latitude and longitude, standardized to number of individuals caught per hour for a 40ft trawl, are presented in Figure 2. Young red snapper taken during this survey were primarily young-of-the-year with $< 0.1\%$ of the specimens taken measuring > 10 inches in length. This fishery-independent data summary is the second in the series of such reports for red snapper and is provided for the use and

information of fishery biologists, the fishing industry, and other interested parties.

In determining trends in recruitment for the most recent stock assessment (**Schirripa, M. J., and C. M. Legault.** 1999. Status of the red snapper in U.S. waters of the Gulf of Mexico: Updated through 1998. Sustainable Fisheries Division Contribution SFD-99/00-75. SE Fisheries Science Center, Sustainable Fisheries Division.), the authors state:

> "In order to maintain a consistent time series, the samples selected for inclusion in indexing red snapper recruitment strength were from the primary survey area that includes depths of 5 to 50 fathoms between 88° and 91°30'W."

This area does not include survey areas in Texas waters.

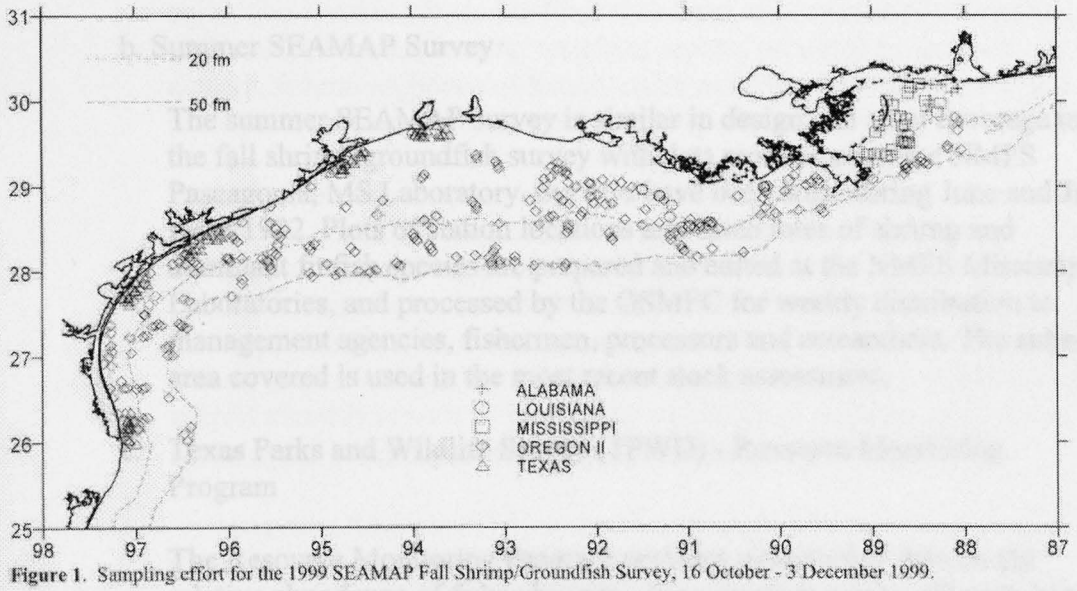

Figure 1. Sampling effort for the 1999 SEAMAP Fall Shrimp/Groundfish Survey, 16 October - 3 December 1999.

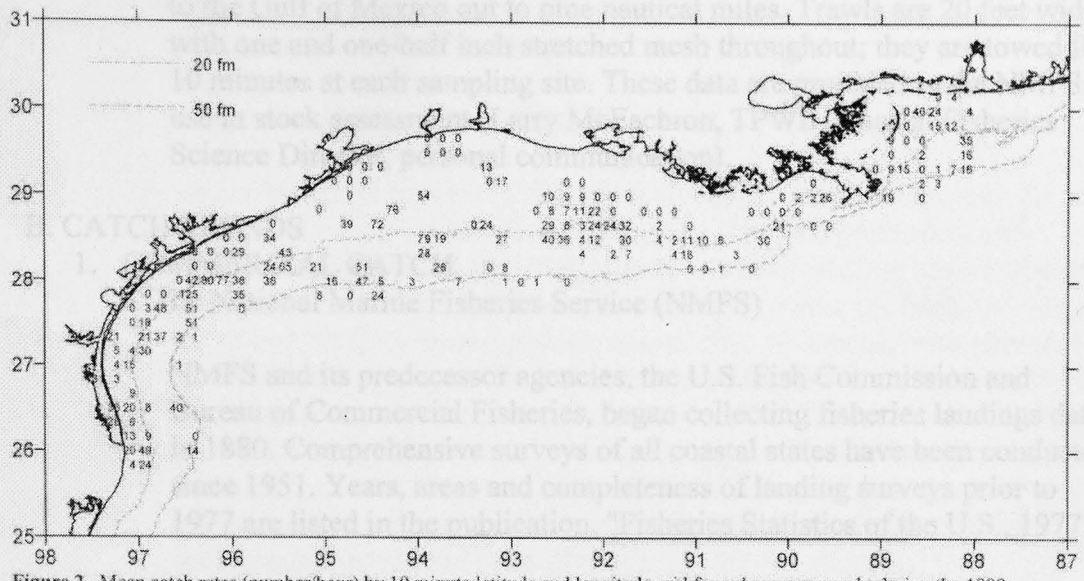

Figure 2. Mean catch rates (number/hour) by 10 minute latitude and longitude grid for red snapper caught during the 1999 SEAMAP Fall Shrimp/Groundfish Survey. Catch rates have been standardized to number caught per hour for a 40-ft trawl.

b. Summer SEAMAP Survey

The summer SEAMAP survey is similar in design and areal coverage to the fall shrimp/groundfish survey with data maintained at the NMFS Pascagoula, MS Laboratory. Surveys have been done during June and July since 1982. Plots of station locations and catch rates of shrimp and dominant finfish species are prepared and edited at the NMFS Mississippi Laboratories, and processed by the GSMFC for weekly distribution to management agencies, fishermen, processors and researchers. The entire area covered is used in the most recent stock assessment.

c. Texas Parks and Wildlife Survey (TPWD) - Resource Monitoring Program

The Resource Monitoring Program provides quantitative data on the relative abundance of fishes by using four sampling gears: gill nets, bag seines, beach seines and trawls. Each gear gives information on different sizes of fish. This standardized program monitors finfish populations in the Sabine Lake, Galveston, East Matagorda, Matagorda, San Antonio, Aransas, Corpus Christi, upper Laguna Madre, and lower Laguna Madre bay systems as well as in the Gulf of Mexico out to nine nautical miles. Through this program, relative abundance and average size of fishes and species composition in the samples are determined. Additionally, hydrological and meteorological measurements are taken at the time of each sample to examine possible relationships between finfish availability and water and weather conditions.

Sixteen trawl samples are collected monthly off each of five major passes to the Gulf of Mexico out to nine nautical miles. Trawls are 20 feet wide with one and one-half inch stretched mesh throughout; they are towed for 10 minutes at each sampling site. These data are provided to the NMFS for use in stock assessment (Larry McEachron, TPWD, Coastal Fisheries Science Director, personal communication).

B. CATCH TRENDS

1. COMMERCIAL CATCH

a. The National Marine Fisheries Service (NMFS)

NMFS and its predecessor agencies, the U.S. Fish Commission and Bureau of Commercial Fisheries, began collecting fisheries landings data in 1880. Comprehensive surveys of all coastal states have been conducted since 1951. Years, areas and completeness of landing surveys prior to 1977 are listed in the publication, "Fisheries Statistics of the U.S., 1977."

The collection of U.S. commercial fisheries landings data is a joint state and federal responsibility. The cooperative State-Federal fishery data collection systems obtain landings data from state-mandated fishery or mollusk trip-tickets, landing weighout reports provided by seafood dealers, federal logbooks of fishery catch and effort, and shipboard and portside interview and biological sampling of catches.

Statistics for each state represent a *census* of the volume and value of finfish and shellfish landed and sold at the dock rather than an expanded estimate of landings based on sampling data. Principal landing statistics that are collected consists of the pounds and ex-vessel dollar value of landings identified by species, year, month, state, county, port, water and fishing gear. Most states get their landings data from seafood dealers who submit monthly reports of the weight and value of landings by vessel (http://www.st.nmfs.gov/commercial/landings/back.html).

b. Trip Interview Program (TIP) of the State/Federal Cooperative Statistics Program

These data are used to characterize the size composition of red snapper landed by different commercial gears each year. Data are available from 1984 to the present and are maintained by the Fishery Dependent Data Group of the Southeast Fishery Science Center (SEFSC, NMFS) Research Management Division.

c. Reeffish Logbook Program

The Reeffish Logbook Program was initiated in 1990. This program requires that all vessels holding reeffish permits in the states of Alabama,

Mississippi, Louisiana, and Texas, and all trap fishers, report on each fishing trip made. *Releases* are not reported in this program and these estimates only reflect fish kept.

d. Texas Parks and Wildlife (TPWD)

The commercial harvest of finfish resources is monitored through the Commercial Harvest Monitoring Program. This program relies on a legislatively mandated reporting system in which seafood dealers report their purchases of aquatic products monthly. Aquatic products include any uncooked, fresh or frozen aquatic animal life. All dealers who purchase or receive aquatic products directly from commercial fishermen must file a monthly report with the Department on or before the 10th day of each month following the month in which the reportable activity occurred. These reports provide information on the numbers of pounds, price paid per pound and water body from which the aquatic products were taken for each species purchased or received.

Landings are collected through the Texas Parks and Wildlife Department, Coastal Fisheries Division's Monthly Aquatic Products Report Program and include over 410 licensed seafood and bait dealers. For more information, contact Commercial Statistics Program, Seabrook Marine Laboratory, P.O. Box 8, Seabrook, TX 77586, telephone (713)474-2811, FAX (713)474-2812. Unless otherwise noted, all weights are whole weights.

e. Discards

A NMFS observer program was initiated in 1995 (only) to collect data on reeffish fisheries in the Gulf of Mexico. Included were some red snapper trips aboard commercial handline boats. Observers recorded the lengths and fates of the catch, including discards. Observations were collected offshore of Louisiana and Texas of fish caught at an average depth of 20 fathoms (16 – 31 fm). Discards constituted 40.7% of red snapper caught (18.6% by weight). Approximately 1.6% were discarded dead, but most of the discards had either stomachs or eyes protruding and many probably were subject to delayed mortality.

2. RECREATIONAL CATC H

a. National Marine Fisheries Service Marine Recreational Fisheries Statistics Survey (MRFSS)

Covers shore, charter and private/rental boat fishing activities (#s released, #s landed, & pounds landed) for Florida through Louisiana (1986 – 1998). Texas data are *only* available for 1983 – 1985. Texas estimates of *released* fish are only available from 1985 MRFSS data). MRFSS data is collected

by contractors conducting two independent surveys: a telephone survey of coastal households, and an interview survey of anglers as they return from fishing.
(http://www.st.nmfs.gov/st1/recreational/hot_topics/red_snapper/red_snap.html)

Marine recreational fishing in Texas is monitored by the Texas Department of Parks and Wildlife and has not been surveyed by the MRFSS since 1985. The Texas Parks and Wildlife Department collects and provides data to NMFS in lieu of NMFS conduct of the MRFSS in Texas (called the Texas Survey).
(http://www.psmfc.org/recfin/mrfssov.htm#PRECISION).

b. National Marine Fisheries Service Headboat Survey (HB)

Covers headboat activity (#s & pounds landed (1986 – 1997) & angler days (1987 – 1997) for Florida through Texas except for Texas inshore (bay) headboats. Does not include discards.

c. Texas Parks and Wildlife Survey (TPWD) - Sport Harvest Monitoring Program

Covers #s landed by:
Mode: charter & private boats (1986 +) & inshore headboats (1986 - 1990);
Wave (6, 2-month periods): 1986 +;
Size frequency (frequency of total length landed): 1986 – 1996;
Land frequency (frequency of # landed): 1987 +;

Covers pounds landed: 1986 +.
Does not include shorebound fishers.

Seasonal landings, angling pressure in working hours, catch per effort, average length and weight of fishes, and species composition of the catches are determined for the recreational fisheries in each bay system and in the Gulf of Mexico next to each bay system. Interviews of private-boat and charter-boat sport anglers are conducted at randomly selected boat-access sites to obtain daily catch per effort data upon completion of fishing trips. Limited social and economic data are also collected during these interviews. To define the relative distribution of fishing pressure, roving counters travels by automobile to all boat-access sites in a bay system on selected days to count boat trailers and empty wet-slips. Projections of landings are then accomplished using estimator equations (http://www.tpwd.state.tx.us/fish/geninfo/txfinmon.htm).

d. Discards

The current stock assessment estimates recreational releases from the MRFSS survey. The number of discarded fish that died and contributed to fishing mortality was estimated using *estimates of discards multiplied by estimates of release mortality (20%).*

3. SHRIMP TRAWL DISCARDS
Shrimp trawl bycatch, while not part of the red snapper harvest, does contribute to fishing mortality. Recent annual estimates of shrimp trawl bycatch are derived from NMFS observer data taken as part of a cooperative research program on finfish bycatch in the shrimp fisheries of the SE U.S. coast. Older estimates came from models to predict catch rates from resource survey data based on the relationship between resource survey catch rates and direct measurements of catch rates by observers aboard shrimp vessels.

IV. WHAT OTHER TEXAS DATA ARE AVAILABLE BUT NOT USED IN STOCK ASSESSMENT?

A. BIOLOGICAL CHARACTERISTICS

1. AGE AND GROWTH

a. **Bumguardner, B. W., R. L. Colura, E. Young, D. Westbrook, and R. Buckley.** 1996. Determination of selected life history characteristics of red snapper (Lutjanus campechanus) along the Texas Gulf coast. Federal Aid Final Report F-36-R. Texas Parks and Wildlife Department, Coastal Fisheries Division, Perry R. Bass Marine Fisheries Research Station.

A total of 1,234 red snapper were examined. Snapper were collected from head boats from Port Aransas, private sport boat catches and Texas Parks and Wildlife sampling gear (trawls, longlines, hook-and-line). Additional samples from Brownsville, Texas to Panama City, Florida were collected from the National Marine Fisheries Service and from commercial shrimp trawl by-catch. Reproductive biology and age and growth were investigated. Estimates of batch fecundity and spawning frequency were obtained, along with the percentage of an age class that was reproductively mature. Annual fecundity estimates were made based on age, batch fecundity and spawning frequency. Estimated annual fecundity is considerably higher than those presented in the stock assessment, but a similar pattern of rapidly increasing fecundity with age was observed. Red snapper females less than 4 years old have a relatively low fecundity and a shorter spawning season, with the result that they should not contribute significantly to annual reproduction unless they make up a majority of the population.

b. **Holt, S. A., and C. R. Arnold.** 1982. Growth of juvenile red snapper *Lutjanus campechanus*, in the northwestern Gulf of Mexico. Fishery Bulletin. **80**(3):644-648.

Examined length-frequency distributions of juvenile red snapper collected in fish traps from artificial reefs in 32 fathoms of water, 50 miles off of Port Aransas, TX, and from trawl sampling on the south Texas outer continental shelf (Port O'Conner to Port Isabel) during 1975 – 1977. Depths ranged from 5 – 66 fathoms. Small snapper (<1.6" long) began appearing in collections during the summer. Snapper longer than 6" were uncommon in trawl collections from the continental shelf. Snapper 5 – 10" were common on artificial reefs from July through December.

2. DISTRIBUTION & MOVEMENTS

Small snapper are found at all depths sampled out to 50 fm. Inshore-offshore movements are reported and may be related to seasonal weather patterns such as hurricanes. Extended east-west movements have also been reported. Short-range movements could result in the gradual dispersal of individuals through movements away from centers of abundance. These movements could also explain rapid colonization of artificial reefs by multiple age classes of snapper. However, it is also possible that the main dispersal mechanism is the transport of eggs & early larvae by currents and hurricanes.

The suggestion has been made that there exists a pool of older & larger red snapper currently unavailable to the fishery, as evidenced by data from the commercial bottom longline fishery showing larger and older fish than those caught by handlines. To attempt to verify this pool of fish, NOAA conducted a 2-week research cruise in May 1999 off of Alabama. The cruise objective was to determine the presence or absence of red snapper in deep water (35-80 fm) in the NE Gulf of Mexico via longline or hook and line. Seventy-two stations were sampled with 100 hooks per station soaked for one hour. A total of 7 red snapper were caught with a total weight of 44.9 lbs., with the largest one 18.7 lbs. The remaining 6 fish totaled 26.2 lbs., for and average of 4.4 lbs. each (Schirripa and Legault 1999).

a. **Moseley, F. N.** 1966. Biology of the red snapper, *Lutjanus aya* Bloch, of the northwestern Gulf of Mexico. Publications of the Institute of Marine Science, University of Texas. **11:**90-101.

Adult (5 locations) and juvenile (7 locations) red snapper were collected from Texas coastal waters, along with 12 locations in Louisiana. Adult red snapper were primarily found over hard limestone bottoms or irregular bottom formations. Juveniles were found only in waters over sandy and muddy bottoms. Some offshore migration may occur during cold fronts.

b. **Bradley, E., and C. E. Bryan.** 1975. Life history and fishery of the red snapper (*Lutjanus campechanus*) in the northwestern Gulf of Mexico: 1970-74. Proceedings of the Gulf and Caribbean Fisheries Institute. **27:**77-106.

Red snapper were collected from 3 regions along the Texas coast (Galveston-Freeport, Port Aransas, and Port Isabel-Port Mansfield) using hook and line (reefs, 7.5 - 80 fm; primarily along the 40 fm depth contour) and bottom trawls (3 – 95 fm). Juveniles were collected in trawls between 3 and 45 fm along the entire Texas coast on level, trawlable bottom with seasonal variations in distribution and abundance. The youngest snapper were collected in the summer and moved offshore as time progressed. A portion of the population moves back to shallower water during spring and summer.

c. **Fable, W. A., Jr.** 1980. Tagging studies of red snapper (*Lutjanus campechanus*) and vermilion snapper (*Rhomboplites aurorubens*) off the south Texas coast. Contributions in Marine Science. **23:**115-121.

Two hundred ninety-nine red snapper were tagged at 6 locations along the south Texas coast at depths between 25 – 34 fm. 5.6 percent of the tags were recovered between 59 – 253 days later. Only one red snapper moved to an adjacent rig (8 miles away) after 162 days. The rest were recovered in the area from which they were originally tagged.

d. **Holt, S. A., and C. R. Arnold.** 1982. Growth of juvenile red snapper Lutjanus campechanus, in the northwestern Gulf of Mexico. Fishery Bulletin. **80**(3):644-648.

Examined length-frequency distributions of juvenile red snapper collected in fish traps from artificial reefs in 32 fathoms of water, 50 miles off of Port Aransas, TX, and from trawl sampling on the south Texas outer continental shelf (Port O'Conner to Port Isabel) during 1975 – 1977. Depths ranged from 5 – 66 fathoms. Small snapper (<1.6" long) began appearing in collections during the summer. Snapper longer than 6" were uncommon in trawl collections from the continental shelf. Snapper 5 – 10" were common on artificial reefs from July through December.

3. STOCK STRUCTURE

Traditional analysis of genetic variation in mitochondrial DNA supports the idea of a single genetic stock. However, some differences in mitochondrial DNA in samples from Texas, Alabama and Florida suggest that the fish came from genetically distinct sources. However, the authors noted that their results should be viewed with some reservation because the sample sizes were somewhat restricted. As a result, although there is some evidence to the

contrary, the best available information suggests that management of the U.S. Gulf of Mexico red snapper as a single stock is appropriate.

a. **Camper, J. D., R. C. Barber, L. R. Richardson, and J. R. Gold.** 1993. Mitochondrial DNA variation among red snapper (*Lutjanus campechanus*) from the Gulf of Mexico. Molecular Marine Biology and Biotechnology **2**(3):154-161.

Variations in mitochondrial DNA (mtDNA) were examined among 86 red snapper from Florida (25), Louisiana (36), and Port Aransas, Texas (25). Findings were consistent with the idea that red snapper in the northern Gulf make up a single panmictic (randomly mixing) population. The observed genetic homogeneity also indicated considerable gene flow (movement of genes from one population to another via interbreeding) among red snapper in the northern Gulf.

b. **Gold, J. R., L. R. Richardson, C. Furman, and F. Sun.** 1994. Mitochondrial DNA diversity and population structure in marine fish species from the Gulf of Mexico. Canadian Journal of Fisheries and Aquatic Sciences. **51**(Supplement 1):205-214.

Variations in mitochondrial DNA (mtDNA) were examined among 421 red snapper from Florida (75), Alabama (53), Louisiana (90), and from offshore locations near Lower Laguna Madre (52), Redfish Bay (60), and Galveston Bay (47), Texas. Red drum and black drum were also examined. Red snapper samples were not strongly differentiated genetically and those collected in nearby locations were no more similar genetically than those geographically distant from each other.

c. **Chapman, R. W., S. A. Bortone, and C. M. Woodley.** 1995. A molecular approach to stock identification and recruitment patterns in red snapper, *Lutjanus campechanus*. Final Report for Cooperative Agreement #NA17FF0379-03 Marine Fisheries Initiative (MARFIN) Program. Institute for Coastal and Estuarine Research, University of West Florida, Pensacola, Florida 32514. Marine Resources Research Institute, South Carolina Wildlife and Marine Resources Department, Charleston, South Carolina 29412. [DO NOT HAVE]

Found some differences in mitochondrial DNA in red snapper samples from Texas, Alabama and Florida which suggest that the fish came from genetically distinct sources. However, the authors noted that their results should be viewed with some reservation because the sample sizes were somewhat restricted.

d. **Kristmundsdóttir, Á. Y., R. C. Barber, and J. R. Gold.** 1996. Restriction-enzyme-site maps of mitochondrial DNA from red snapper

(Lutjanus campechanus) and king mackerel (Scomberomorus cavalla). Gulf of Mexico Science. **14**(1):31-35.

Variations in mitochondrial DNA (mtDNA) were examined among 707 red snapper from across the northern Gulf of Mexico, from near Port Isabel, Texas to near Panama City, Florida and from near Merida, Mexico. This study developed maps of restriction-enzyme-sites of mtDNA from red snapper that will allow comparisons of mtDNA variation from among studies from different laboratories. In addition, identification of specific mtDNA restriction sites is useful in cloning and analysis of specific regions of the mtDNA molecule.

e. **Gold, J. R., F. Sun, and L. R. Richardson.** 1997. Population structure of red snapper from the Gulf of Mexico as inferred from analysis of mitochondrial DNA. Transactions of the American Fisheries Society. **126**(3):386-396.

Variations in mitochondrial DNA (mtDNA) were examined among 707 red snapper from across the northern Gulf of Mexico, from near Port Isabel, Texas to near Panama City, Florida and from near Merida, Mexico. From Texas, samples were collected from anglers off of Galveston, Port Aransas, and Port Isabel. Variations over space and time are consistent with the idea of a single breeding population (unit stock). But, observed genetic uniformity may reflect historical rather than current gene flow. This means that although populations of red snapper may be isolated now, they may have had enough genetic contact in the past (when glaciations reduced continental shelf area) that populations are not yet distinguishable after the last glacial retreat opened up new habitat in the northern Gulf of Mexico. It is also possible that gene flow may still be occurring through transport of floating eggs and larvae, or the short-term movement of adult red snapper which could lead to gradual dispersal from localized centers of abundance.

4. REPRODUCTION

a. **Bumguardner, B. W., R. L. Colura, E. Young, D. Westbrook, and R. Buckley.** 1996. Determination of selected life history characteristics of red snapper (Lutjanus campechanus) along the Texas Gulf coast. Federal Aid Final Report F-36-R. Texas Parks and Wildlife Department, Coastal Fisheries Division, Perry R. Bass Marine Fisheries Research Station.

A total of 1,234 red snapper were examined. Snapper were collected from head boats from Port Aransas, private sport boat catches and Texas Parks and Wildlife sampling gear (trawls, longlines, hook-and-line). Additional samples from Brownsville, Texas to Panama City, Florida were collected from the National Marine Fisheries Service and from commercial shrimp trawl by-catch. Reproductive biology and age and growth were

investigated. Estimates of batch fecundity and spawning frequency were obtained, along with the percentage of an age class that was reproductively mature. Annual fecundity estimates were made based on age, batch fecundity and spawning frequency. Estimated annual fecundity is considerably higher than those presented in the stock assessment, but a similar pattern of rapidly increasing fecundity with age was observed. Red snapper females less than 4 years old have a relatively low fecundity and a shorter spawning season, with the result that they should not contribute significantly to annual reproduction unless they make up a majority of the population.

B. CATCH TRENDS

1. COMMERCIAL CATCH

a. Trends in Landings

1. **Bradley, E., and C. E. Bryan.** 1975. Life history and fishery of the red snapper (*Lutjanus campechanus*) in the northwestern Gulf of Mexico: 1970-74. Proceedings of the Gulf and Caribbean Fisheries Institute. **27:**77-106 .

Contains estimates of Texas red snapper landings by shrimp trawls for 1950 to 1971.

b. Spatial Distribution

Texas commercial landings are primarily composed of fish from areas off Texas, but some are also taken off Louisiana. In earlier years, a considerable proportion of Texas landings were from Mexican waters.

2. RECREATIONAL CATC H

a. Discards

1. **Dorf, B. A.** 1999. Red snapper discards in Texas coastal waters - a fishery dependent onboard pilot survey of recreational headboat discards and landings. Final Report to the Gulf & South Atlantic Fisheries Foundation, Inc. GASAFFI No. 70-06-21807/11165, TR/99-002. University of Texas Marine Science Institute.

Determined the quantity and characteristics of recreational discards and landings by placing observers on headboats from three Texas ports (Galveston, Port Aransas, and Port Isabel) during August and September, 1999. Fishing trip depth averaged 24 fm (7 – 52 fm) and a total of 3,863 snapper were sampled. Red snapper less than 18 inches made up 92% of snapper caught, and those less than 15 inches made up 76% of the catch.

When brought on board 70% of snapper appeared normal and 26% had their stomach protruding. When discarded, 53% were released alive and swam down, 20% swam erratically, 13% were floating, 1% were dead, and 13% were kept. Fish released dead or floating were collected at deeper depths than those released which swam down or erratically. Galveston had the largest discard:landing ratio (218:1), and smallest average fish size (1.5 pounds, 13.2 inches). Port Aransas had the lowest discard:landing ratio (5.2:1) and the largest average fish size (2.1 pounds, 15.2 inches).

3. SHRIMP TRAWL DISCARDS

a. **Burrage, D. D., S. G. Branstetter, G. Graham, and R. K. Wallace.** 1997. Development and implementation of fisheries bycatch monitoring programs in the Gulf of Mexico. Information Bulletin 324. Mississippi Agricultural & Forestry Experiment Station.

Excellent overview of fisheries bycatch issues, literature and management in the Gulf of Mexico. Conducted a Gulfwide (and beyond) survey of agencies and organizations to determine existing and on-going data and developed a data catalog. Included the following fisheries: commercial shrimp, trap, pelagic longline, bottom longline and commercial hook-and-line, recreational shrimp, purse seine, gill and trammel net, finfish trawls, and recreational hook-and-line.

b. **Gallaway, B. J., M. Longnecker, J. G. Cole, and R. M. Meyer.** 1998. Estimates of shrimp trawl bycatch of red snapper (Lutjanus campechanus) in the Gulf of Mexico, p. 817-839. In F. Funk, T. J. Quinn, II, J. Heifetz, J. N. Ianelli, J. E. Powers, J. F. Schweigert, P. J. Sullivan, and C.-I. Zhang (eds.), Fishery Stock Assessment Models. Alaska Sea Grant College Program Report No. AK-SG-98-01, Fairbanks, AK.

Bycatch estimates are generated by the NMFS using a general linear model which establishes a relationship between resource trawl survey data and catch data from the fishery obtained by observers on shrimp fishing vessels. The more complete time series of resource trawl data is then used to predict commercial vessel CPUE which is multiplied by total fishing effort to determine bycatch. The authors have attempted to improve these estimates by modifying how the model is structured & analyzed. The revised bycatch estimates in recent years averaged on the order of 30 to 47% lower than the NMFS estimates. Nevertheless, bycatch levels are high (26 to 32 million per year) and are increasing due to increasing abundance of juveniles. However, the age of structure of the bycatch may consist of a much larger fraction of age-0 fish and fewer age-1 fish than has been thought. The authors point out that since Bycatch Reduction

Devices (BRDs) do not effectively exclude age-0 red snapper, the existing stock recovery policy based on NMFS GLM bycatch estimates and using BRDs to reduce shrimp trawl mortality of juvenile red snapper may be ineffective.

V. WHAT TEXAS DATA ARE MISSING OR NEEDED (PRELIMINARY)?

A. BIOLOGICAL CHARACTERISTICS

1. AGE AND GROWTH

Recent Texas reproductive biology, age, and growth data by Bumbgardner et al (1996) are not included in the most recent stock assessment. Length-frequency distributions of juvenile red snapper from the Texas continental shelf by Holt and Arnold (1982) are also not included.

2. MORTALITY

a. Natural Mortality

Level of natural mortality in the Gulf of Mexico red snapper stock is not well defined, even though it is an important variable for the assessment of the status of the stock and its management. Most analyses in past red snapper stock assessments have assumed a natural mortality rate of 0.20 based on estimates in the literature, although observations indicate that the true level of natural mortality is probably less than 0.2. A number of modeling methods to estimate natural mortality are described in the current stock assessment, but these estimates are imprecise & of questionable statistical validity because of their derivation from fished stocks with variable recruitment. The result is that *there is little evidence for the actual level of natural mortality for Gulf of Mexico red snapper.*

b. Release Mortality

Sources of release mortality include hooking and handling, in addition to predation of released fish in areas with concentrations of large predators. Mortality of fish released because of size and bag limits is to be expected and the mortality rate may increase with depth of capture, although the precise nature and extent of this mortality is not clearly defined.

3. DISTRIBUTION & MOVEMENTS

The distribution and movements of red snapper eggs, larvae, juveniles and large adult red snapper are poorly defined in Texas waters and throughout the Gulf.

4. STOCK STRUCTURE

Although there is some evidence to the contrary, *currently available* information suggests that management of Gulf of Mexico red snapper as a single stock is appropriate.

5. REPRODUCTION

- The locations of red snapper spawning grounds in Texas are unknown.
- Recent Texas reproductive biology, age, and growth data by Bumguardner et al (1996) are not included in the most recent stock assessment.
- How eggs and larvae are distributed throughout the Gulf of Mexico by water movements is also unknown at this time.
- Fecundity-at-age appears to be poorly understood for Texas waters.

6. GENERATION TIME

Important because the management plan for red snapper specifies that the recovery schedule is to be no greater than 1.5 times the unfished generation time. Generation time is estimated using, among other poorly defined variables, estimates of fecundity at age, and natural mortality of females at different ages. Both of these variables are either uncertain or lack available Texas data.

7. RECRUITMENT PATTERNS

Indexes of red snapper recruitment strength based on the fall groundfish survey (SEAMAP) do not include available survey data from Texas waters.

B. CATCH TRENDS

1. COMMERCIAL CATCH

Commercial discards are not well documented, along with the associated mortality.

2. RECREATIONAL CATCH

The current stock assessment estimates recreational discards from the MRFSS survey (telephone interviews of coastal households and angler dock interviews). The number of discarded fish that die and contribute to

fishing mortality is estimated using *estimates of discards multiplied by estimates of release mortality (20%).* Discard & mortality rates are not well defined.

3. SHRIMP TRAWL DISCARDS

Recent annual estimates of shrimp trawl bycatch are derived from NMFS observer data taken as part of a cooperative research program on finfish bycatch in the shrimp fisheries of the SE U.S. coast. Older estimates came from models to predict catch rates from resource survey data based on the relationship between resource survey catch rates and direct measurements of catch rates by observers aboard shrimp vessels. Discard & mortality rates are not well defined.

Gallaway, et al. (1998) attempted to improve shrimp trawl bycatch estimates by modifying how the NMFS model is structured & analyzed. They found that the age of structure of the bycatch may contain a much larger fraction of age-0 fish and fewer age-1 fish than has been thought. The authors point out that since Bycatch Reduction Devices (BRDs) do not effectively exclude age-0 red snapper, the existing stock recovery policy based on NMFS GLM bycatch estimates and using BRDs to reduce shrimp trawl mortality of juvenile red snapper may be ineffective.

VI. HISTORY OF MANAGEMENT IN THE GULF OF MEXICO

Management activities described below pertain specifically to red snapper, although other fish species are also regulated under the Reef Fish FMP.

The REEF FISH FISHERY MANAGEMENT PLAN was implemented in *November 1984* and was designed to rebuild declining reef fish stocks.

Minimum size limit of 13 inches total length (TL) with the exceptions that for-hire boats were exempted until 1987 and each angler could keep 5 undersize fish. Data reporting was also required.

National Marine Fisheries Service (NMFS)

Commercial Landings Data:	Since 1950's
Recreational Harvest Data:	Since 1979
Dockside Interview (Commercial Harvest):	Initiated 1984
Red Snapper Stock Assessment (1st)	1988
Red Snapper Stock Assessment (2nd)	1990

First Stock Assessment (1988) indicated that:

- Red snapper were significantly overfished.
- Reductions in fishing mortality rates of as much as 60 - 70% were necessary to rebuild red snapper to a recommended 20% spawning stock potential ratio (SPR).
- Identified shrimp trawl bycatch as a significant source of mortality.

Amendment 1, implemented in 1990, set the FMP primary objective as stabilization of long-term population levels of all reef fish species. This was to be accomplished by establishing a survival rate of biomass into the spawning age stock to achieve at least 20% spawning stock biomass per recruit (SSBR), relative to the SSBR that would occur with no fishing.

Designed to reduce fishing mortality by 20% and begin a rebuilding program for the stock.

Recreational bag limit	7 fish
Commercial quota	3.1 million pounds

Reef Fish Scientific Assessment Panel (RFSAP) met in March 1990 to review the *1990 Red Snapper Stock Assessment*. Recommended to:

- Close the directed fishery because,
- Allowable Biological Catch (ABC) was being harvested as bycatch of the shrimp trawl fishery.
- No means existed for reducing trawl bycatch, therefore,
- No alternatives were identified that would achieve the 20% SPR goal by the year 2000 without closing the directed fishery.

REGULATORY AMENDMENT (March 1991)

- Reduced TAC from 5.0 million pounds to 4.0 million pounds beginning in 1991

Commercial quota	2.04 million pounds
Recreational bag limit	7 fish (1.96 million pounds)

Also contained a proposal by the Council to effect a 50% bycatch reduction by the offshore EEZ shrimp trawler fleet in 1994, through:

- Mandatory use of finfish excluder devices on shrimp trawls,
- Reductions in fishing effort,
- Reductions in fishing area,
- Season closures of the shrimp fishery, or
- A combination of these actions.

These combined measures were projected to achieve a 20% SPR by 2007. The 1991 quota was reached on August 24, and the fishery was closed in the EEZ for the remainder of the year.

Amendment 3, implemented in July 1991, provided additional flexibility in the annual framework procedure for specifying Total Allowable Catch (TAC).

- Allowed the target date for rebuilding an overfished stock to be *changed* depending on changes in scientific advice, *except* that the rebuilding period cannot exceed 1.5 times the generation time of the species.
- Revised the FMP primary objective, definitions of optimum yield and overfishing.
- The 20% SSBR target was replaced with a 20% spawning potential ratio (SPR).
- Established a new target year for achieving the 20% SPR goal of 2007.

The *1992 Commercial Fishery* (with the commercial quota remaining at 2.04 million pounds) opened January 1 & closed 53 days later (February 22) as a result of a derby fishery.

NMFS Emergency Rule, implemented in 1992.

- Reopened the commercial fishery from April 3, 1992 through May 14, 1992 with a trip limit of 1,000 pounds
- Designed to alleviate economic and social upheavals as a result of the rapid filling of the 1992 commercial quota.
- Resulted in a quota overrun of approximately 600,000 pounds
- NMFS biologists determined that this one time overrun would not prevent the stock from attaining its target SPR.

Amendment 4, implemented in May 1992, established a moratorium on the issuance of new reef fish permits for a maximum period of three years. Created to moderate short-term future fishing effort increases and to attempt to stabilize fishing mortality while the Council considered a more comprehensive effort limitation program. Also changed the time of year that TAC is specified from April to August.

REGULATORY AMENDMENT (October 1992)

- Raised TAC from 4.0 million pounds to 6.0 million pounds beginning in 1993

Commercial quota	3.06 million pounds
Recreational bag limit	7 fish (2.94 million pounds)

- Established a new target year for achieving the 20% SPR goal of 2009.

The new target year was based on the FMP provision that the rebuilding period may be for a time span not exceeding 1.5 times the potential generation time of the stock. An estimated red snapper generation time by Goodyear (1992) was 13 years.

NMFS Emergency Rule, implemented December 30, 1992.

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NMFS Emergency Rule, implemented December 30, 1992.

- Created a red snapper endorsement to the reef fish permit for the start of the 1993 season.
- Endorsements issued to historical stakeholders (1990-92).
- Vessels with endorsements are allowed 2,000 pound possession limits
- Vessels without endorsements are allowed 200 pound possession limits.
- Emergency rule initially effective for 90 days but extended for an additional 90 days.
- The 1993 season was delayed until February 16 so NMFS could process & issue endorsements.

Amendment 5, implemented in February 1994, established a schedule to gradually raise the minimum size limit to 16 inches over a period of five years.

Amendment 6, implemented in June, 1993, extended the provisions of the emergency rule for red snapper endorsements for the remainder of 1993 and 1994, unless replaced by a comprehensive effort limitation program. Also allowed the trip limits to be changed under the framework procedure for TAC specification.

REGULATORY AMENDMENT (October 1993)

- Retained TAC at 6.0 million pounds as in 1993

Commercial quota	3.06 million pounds
Recreational bag limit	7 fish (2.94 million pounds)

- Set the opening of the 1994 commercial fishery as February 10, 1994
- Restricted commercial vessels to landing no more than one trip limit per day.

The purpose was to facilitate enforcement of trip limits, minimize fishing during hazardous winter weather, and ensure that the commercial fishery was open during Lent, a time of high seafood demand.

Amendment 8 was to be implemented in April 1996. It proposed to establish the Individual Transferable Quota (ITQ) system, allocating percentage shares of the commercial quota to vessel owners and historical operators based of historical participation in the fishery during 1990 - 1992. During a four-year harvest period under the ITQ program, the Council and NMFS would monitor and evaluate the program, deciding whether to extend, terminate or modify it. A special appeals board was to consider requests from those contesting their initial share allocation and determination of historical captains. The federal government shutdown of December 1995 - January 1996 postponed the appeals board meeting and brought out questions about federal funding for the ITQ program pending congressional action. Congress, through the reauthorization of the Magnuson-Stevens Act in October 1996, repealed the red snapper ITQ system and prohibited Councils from submitting, or NMFS from approving and implementing, any new individual fishing quota program before October 1, 2000.

Amendment 9, implemented in July 1994, provided for collection of commercial landings and eligibility data for the years 1990 - 1992. The purpose was to evaluate the initial effectiveness of limited access measures being considered under *Amendment 8* and to identify qualifying fishers for initial participation under a limited access system. Also extended the reef fish permit moratorium and endorsement system through December 31, 1995.

REGULATORY AMENDMENT (October 1994)

- Retained TAC at 6.0 million pounds as in 1993

Commercial quota	3.06 million pounds
Recreational bag limit	5 fish (2.94 million pounds)

- Set the opening of the 1995 commercial fishery as February 24, 1995
- Retained the restriction on commercial vessels to landing no more than one trip limit per day.
- Increased the recreational size limit from 14 inches TL to 15 inches TL.

The recreational bag limit was reduced from 7 to 5 fish, and the size limit increased ahead of the scheduled automatic increase, because the recreational sector had exceeded its quota each year since 1992.

REGULATORY AMENDMENT (December 1995)

- Raised the 1996 TAC from 6.0 million pounds to 9.12 million pounds

Commercial quota	4.65 million pounds
Recreational bag limit	5 fish (4.47 million pounds)

- Retained the recreational size limit at 15 inches TL.

The recovery target date to achieve 20 percent SPR was extended to the year 2019, based on new biological information that red snapper live longer and have a longer generation time than previously believed.

Amendment 11 was partially approved by NMFS and implemented in January 1996. Approved provisions were:

- Limit sale of Gulf reef fish by permitted vessels to permitted reef fish dealers;
- Require permitted reef fish dealers to purchase reef fish caught in Gulf waters only from permitted vessels;
- Implement a new reef fish permit moratorium for no more than 5 years or until December 31, 2000 while the Council considers limited access for the fishery.

NMFS *disapproved* a proposal to redefine Optimum Yield (OY) from 20% SPR (the same level as overfishing) to an SPR corresponding to a fishing mortality rate of $F_{0.1}$ until an alternative operational definition of OY could be developed that optimized ecological, economic, and social benefits to the Nation.

In April 1997, the Council resubmitted the OY definition with a new proposal to redefine OY as 30% SPR. The resubmission document was *disapproved* by NMFS.

An *Emergency Interim Action* was published in the Federal Register on January 2, 1996 to extend the red snapper endorsement system for 90 days. This followed the congressional repeal of the red snapper ITQ system in *Amendment 8*. That emergency action was superceded by another *Emergency Action*, published in the Federal Register on February 29, 1996, that extended the endorsement system through May 29, 1996, and subsequently, by agreement of NMFS and the Council, for an additional 90 days until August 27, 1996.

ADDENDUM TO REGULATORY AMENDMENT (March 1996)

- Split the 1996 and 1997 commercial red snapper quotas into two seasons
  1st opening February 1 — 3.06 million pound quota
  2nd opening September 15 — 1.59 million pound quota (remainder of annual quota).

Amendment 12, submitted in December 1995 and implemented in January 1997. NMFS *disapproved* proposed provisions for the commercial sector to cancel the automatic red snapper size limit increases to 15 inches total length (TL) in 1996 and 16 inches TL in 1998.

Amendment 13, implemented in September 1996, extended the endorsement system through the remainder of 1996 and, if necessary, through 1997, to give the Council time to develop a permanent limited access system that was in compliance with the new provisions of the Magnuson-Stevens Act.

REGULATORY AMENDMENT (March 1997)

- Changed the opening date of the 2nd 1997 commercial season from September 15 to September 2 at noon & closed the Sean on September 15 at noon
- Thereafter, the commercial season was opened from noon of the 1st day to noon of the 15th day of each month until the 1997 quota was reached.

Complied with the new Magnuson-Stevens Act requirement that recreational red snapper be managed under a quota system by authorizing the NMFS Regional Administrator to close the recreational fishery in the EEZ at such time as projected to be necessary to prevent the recreational sector from exceeding its allocation.

Subsequent to implementation of a recreational red snapper quota, the recreational fishery filled its 1997 quota of 4.47 million pounds, and was closed on November 27, 1997 for the remainder of the calendar year.

REGULATORY AMENDMENT (November 1997)

Cancelled a planned increase in the red snapper minimum size limit to 16 inches TL that had been implemented through *Amendment 5*, and retained the 15-inch TL minimum size limit.

Amendment 15, implemented in January 1998, established a permanent two-tier commercial red snapper license limitation system to replace the temporary endorsement system.

- Class 1 licenses & initial 2,000 pound trip limits were issued to endorsement holders as of March 1, 1997.
- Class 2 licenses & initial 200 pound trip limits were issued to other reef fish permit holders as of March 1, 1997 who had any red snapper landings between January 1, 1990 and March 1, 1997.
- Vessels without Class 1 or 2 licenses were prohibited from commercial harvest of red snapper.
- Licenses were fully transferable.

The commercial season was split in two, with two thirds of the quota allocated to a February 1 opening and the remaining quota to a September 1 opening. The commercial fishery would open from noon of the first day to noon of the fifteenth day of each month during the season.

REGULATORY AMENDMENT (January 1998)

Proposed maintaining the status quo TAC of 9.12 million pounds, but set a zero bag limit for the captain and crew of for-hire recreational vessels in order to extend the recreational quota season.

NMFS provisionally approved the TAC, releasing 6 million pounds, with release of all or part of the remaining 3.12 million pounds to be contingent upon the capability of shrimp trawl bycatch reduction devices (BRDs) to achieve better than a 50% reduction in juvenile red snapper shrimp trawl mortality.

The zero bag limit for captain and crew of for-hire recreational vessels was not implemented.

Following an observer monitoring program of shrimp trawl BRDs conducted during the Summer of 1998, NMFS concluded that BRDs would be able to achieve the reduction in juvenile red snapper mortality needed for the red snapper recovery program to succeed.

The 3.12 million pounds of TAC held in reserve was released on September 1, 1998.

REGULATORY AMENDMENT (December 1998)

- Retained the 9.12 million pound TAC

Commercial quota	4.65 million pounds
Recreational bag limit	4 fish (4.47 million pounds)

- Reproposed a zero-fish bag limit for the captain and crew of recreational for-hire vessels
- Changed the open days for the commercial Fall season from the first 15 days to the first 10 days per month
- Proposed a reduction in the red snapper minimum size limit from 15 to 14 inches TL, and a March 1 opening of the recreational fishing season. These were rejected by NMFS.
- The 4-fish bag limit had already been in effect through an interim rule, but was approved as an ongoing rule by this regulatory amendment.
- The first 10 days per month open days for the commercial Fall season and the zero-fish bag limit for the captain and crew of recreational for-hire vessels were approved and were implemented in the Fall of 1999 after the 1999 recreational season closed. Consequently, the zero-fish bag limit for the captain and crew provision did not take effect during the 1999 recreational season.

REGULATORY AMENDMENT (February 2000)

- Proposes to retain the 9.12 million pound TAC for 2000 and 2001

Commercial quota	4.65 million pounds
Recreational bag limit	4 fish (4.47 million pounds)

- Proposes to set the recreational minimum size limit at 16 inches TL.
- Proposes to reinstate the 4-fish bag limit for the captain and crew of recreational for-hire vessels.
- Proposes to set the recreational fishing season from April 15 through October 31 (Note: The Regional Administrator has revised these dates to be April 21 through October 31 via interim rule.)
- Authorizes the Regional Administrator to adjust the opening and closing dates of the recreational fishing season to accommodate the reinstatement of the 4-fish bag limit for captain and crew of for-hire vessels.
- Sets the commercial Spring season to open on February 1, to be open from noon on the 1st to noon on the 10th of each month until the remaining commercial quota is reached.
- Retains the commercial minimum size limit at 15 inches TL.
- Sets the commercial Spring season sub-quota at 2/3 of the commercial quota, and Fall season sub-quota at the remaining commercial quota.
- Since hooking injuries appear to be the major cause of red snapper release mortality in depths of less than 100 feet, the Council is encouraging fishermen to use circle hooks, which usually hook the fish in the mouth rather than the gut.

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